

Amendments to the Claims

This listing of the Claims will replace all prior versions and listings of the claims in
5 this patent application.

Listing of the Claims

Claims 1-91 (canceled)

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92. (currently amended) A chip package comprising:

a substrate comprising a solder mask layer and a first pad having a surface at a bottom of ~~exposed by~~ a first opening in said solder mask layer;

a silicon chip over said substrate, wherein said silicon chip comprises a
15 second pad having a ~~top~~-surface with a first region, a second region and a third region
between said first and second regions and over said first pad, and a passivation layer
on said first and second regions, wherein said third region is at a top of ~~an~~ a second
opening in said passivation layer ~~is over said third region and exposes said third~~
~~region~~;

20 a copper pillar between said third ~~second~~-region and said first pad, wherein
said copper pillar is connected to said third region through said second opening and to
said first pad through said first opening, and wherein said second pad is connected to
said first pad through said copper pillar;

a metal layer between said copper pillar and said third region, between said

copper pillar and said passivation layer, between said copper pillar and said first region, and between said copper pillar and said second region, wherein said copper pillar is connected to said third region through said metal layer; wherein said metal layer is on said second region, under said passivation layer and under said first and
5 third regions; and

a tin-containing eap-layer between said copper pillar and said first pad,
wherein said copper pillar is connected to said first pad through said tin-containing layer, wherein said tin-containing eap-layer comprises silver, and wherein said
tin-containing eap-layer has a first thickness less than a second thickness of said
10 copper pillar.

Claims 93-96 (canceled)

97. (previously presented) The chip package of claim 92, wherein said copper pillar is
15 electroplated.

Claim 98 (canceled)

99. (currently amended) The chip package of claim 92, wherein said tin-containing
20 eap-layer further comprises copper.

Claim 100 (canceled)

101. (currently amended) The chip package of claim 92 further comprising a conductive layer between said copper pillar and said tin-containing ~~cap~~ layer, wherein said second thickness is greater than a third thickness of said conductive layer.

5 Claims 102 and 103 (canceled)

104. (currently amended) The chip package of claim 92, wherein said tin-containing ~~cap~~ layer has a melting point less than that of said copper pillar.

10 Claim 105 (canceled)

106. (previously presented) The chip package of claim 92, wherein said metal layer comprises titanium.

15 107. (previously presented) The chip package of claim 92, wherein said metal layer comprises a titanium-tungsten alloy.

108. (previously presented) The chip package of claim 92, wherein said metal layer comprises chromium.

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109. (previously presented) The chip package of claim 92, wherein said metal layer comprises copper.

Claims 110-117 (canceled)

118. (currently amended) The chip package of claim 92, wherein said tin-containing ~~cap layer~~ is directly on said copper pillar.

5 Claim 119 (canceled)

120. (currently amended) A bonding structure on a chip comprising a pad having a top surface with a first region, a second region and a third region between said first and second regions, and a passivation layer on said first and second regions, wherein an
10 opening in said passivation layer is over said third region ~~and exposes said third region~~, comprising:

a metal layer on said third region, over said passivation layer and over said first and second regions, wherein said metal layer is connected to said third region through said opening;

15 a copper pillar on said metal layer, over said passivation layer and over said first, ~~and second~~ and third regions, wherein said copper pillar is connected to said third region through said metal layer; and

a tin-containing cap over said copper pillar, wherein said tin-containing cap is connected to said third region through said copper pillar, wherein said
20 tin-containing cap comprises silver, and wherein said tin-containing cap has a first thickness less than a second thickness of said copper pillar.

121. (previously presented) The bonding structure of claim 120, wherein said tin-containing cap is directly on said copper pillar.

122. (previously presented) The bonding structure of claim 120, wherein said tin-containing cap has a greatest transverse dimension less than that of said copper pillar.

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123. (previously presented) The bonding structure of claim 120, wherein said metal layer comprises titanium.

Claim 124 (canceled)

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125. (previously presented) The bonding structure of claim 120, wherein said metal layer comprises chromium.

126. (previously presented) The bonding structure of claim 120 further comprising a
15 conductive layer between said copper pillar and said tin-containing cap, wherein said second thickness is greater than a third thickness of said conductive layer.

127. (previously presented) The bonding structure of claim 120, wherein said metal layer comprises a titanium-tungsten alloy.

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128. (previously presented) The bonding structure of claim 120, wherein said metal layer comprises copper.

129. (previously presented) The bonding structure of claim 120, wherein said tin-containing cap has a melting point less than that of said copper pillar.

Claims 130-150 (canceled)

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151. (currently amended) A bonding structure on a chip comprising a pad having a top surface with a first region, a second region and a third region between said first and second regions, and a passivation layer on said first and second regions, wherein an opening in said passivation layer is over said third region ~~and exposes said third~~

10 ~~region~~, comprising:

a metal layer on said third region, over said passivation layer and over said first and ~~third~~ second regions, wherein said metal layer is connected to said third region through said opening;

a copper pillar on said metal layer, over said passivation layer and over said first, ~~and second~~ and third regions, wherein said copper pillar is connected to said third region through said metal layer; and

a tin-containing cap over said copper pillar, wherein said tin-containing cap is connected to said third region through said copper pillar, wherein said tin-containing cap has a first thickness less than a second thickness of said copper pillar, and wherein said tin-containing cap has a greatest transverse dimension less than that of said copper pillar.

152. (previously presented) The bonding structure of claim 151, wherein said tin-containing cap is directly on said copper pillar.

Claim 153 (canceled)

154. (previously presented) The bonding structure of claim 151, wherein said metal
5 layer comprises titanium.

Claim 155 (canceled)

156. (previously presented) The bonding structure of claim 151, wherein said metal
10 layer comprises chromium.

157. (previously presented) The bonding structure of claim 151, wherein said metal
layer comprises copper.

15 158. (previously presented) The bonding structure of claim 151, wherein said
tin-containing cap comprises silver and copper.

159. (previously presented) The bonding structure of claim 151 further comprising a
conductive layer between said copper pillar and said tin-containing cap, wherein said
20 second thickness is greater than a third thickness of said conductive layer.

160. (previously presented) The bonding structure of claim 151, wherein said metal
layer comprises a titanium-tungsten alloy.

161. (currently amended) The bonding structure of claim 151, wherein said
tin-containing cap comprises silver. metal layer comprises copper.

162. (previously presented) The bonding structure of claim 151, wherein said
5 tin-containing cap has a melting point less than that of said copper pillar.

163. (previously presented) The bonding structure of claim 120, wherein said copper
pillar is electroplated.

10 164. (previously presented) The bonding structure of claim 151, wherein said copper
pillar is electroplated.

165. (new) The bonding structure of claim 120, wherein said tin-containing cap
further comprises copper.